both at the State Normal Schools and the Oconomowoc High School. He adds that the faculty of the Milwaukee Medical College has invited him to outline a course and take charge of the instruction in the elements of meteorology with special reference to medical climatology. The course will begin in September, 1901.

Mr. Leonard M. Tarr, Observer, Weather Bureau, New Haven, Conn., states that during the past two years classes from Yale University have visited the office several times and have been instructed in the use of instruments and the practical work of the Weather Bureau. The faculty of the University have now requested Mr. Tarr to give a more complete course in meteorology covering two hours each week during January and February, 1902. Mr. Tarr is taking a post graduate course in physics, looking to the degree of Ph. D.

Such requests as that mentioned above, whether they are made directly to the observer or indirectly through the Chief of Bureau, are always most heartily indorsed by the Chief, provided the work does not interfere with the official duties of the observers. The interest in meteorology thus manifested by one of our wealthiest universities, already famous by the works of Silliman, Herrick, Newton, and Loomis, encourages one to hope that this important field of science may be properly represented, and that observational, practical, and theoretical meteorology may be diligently cultivated.

ENGLISH VS. METRIC SYSTEM OF MEASUREMENTS.

The progress of meteorology among the different nations of the world is favored or retarded by a variety of circumstances. Thus, in Great Britain and her colonies there is an abiding interest in the weather and in superficial climatology or the description of the prominent features of the climate. The tendency is to look at the weather from a navigator's and a workman's point of view. It is difficult for the average Englishman to apply the methods of the physical laboratory to the problems of meteorology, perhaps, because he sees the intense variability of atmospheric phenomena, and he seems to have no hope of applying to the real atmosphere any of the solutions that the physicist offers him bearing on simpler or idealized problems. Perhaps, also, as suggested by Mr. W. M. Shaw, the Secretary of the Meteorological Office in London:

> There is a great gulf between the physicist and the meteorologist, in that these two branches of science are accustomed to make use of different sets of units, viz, the English and the metric systems, so that a separation has grown up in England between the laboratory and the observatory such as does not exist on the Continent.

In the Bulletin of International Simultaneous Observations the Editor long since undertook to remove this difficulty by presenting all the data for the Northern Hemisphere in both systems of measurement side by side. The international meteorological congresses have uniformly recognized that either English or metric measure may be allowed, but that no other usage is to be encouraged. This is, however, merely a concession to the actual condition of affairs and does not represent any one's idea as to the uniformity that is most desirable.

In France, Germany, and Russia the metric system has been adopted both in the laboratory and at the observing stations, and the proverbial intellectual energy of the European students pushes them forward to great undertakings and profound investigations, in which laboratory experiment goes hand in hand with the observer's field work. In the United States and Canada our citizens are so accustomed to quickly adapt themselves to new conditions that a change from the English to the metric system should very soon become domiciled among us. Inasmuch as American physicists have united with the British and Continental physicists in the almost exclusive use of the metric system, it is becoming annually more and more imperative that the meteorologists of this country should follow suit. This is not altogether a question of sentiment or convenience. Meteorology is, strictly speaking, the physics of the atmosphere. The laws that govern atmospheric phenomena must be determined by experimental and mathematical work into which there enter many physical data whose exact values have been determined and are easily stated in metric units. The relations of these units among themselves is extremely simple in the metric system, but awkward and complex in the English system. Everything that can be done to simplify the difficulties that attend the study of meteorology should be done in order that we may induce the physicists and mathematicians to come to our help. The observer must concede something to the student.

In very many respects it is found to be to the advantage of manufacturers and importers and merchants generally to familiarize themselves with and even to adopt metric measures. All civilized governments have, therefore, legalized the use of the metric system as optional, while many of them make it obligatory. The Imperial Bureau of Standards near Berlin has lately declined to give certificates to any thermometers graduated on the Reamur scale, although this is as popular in Germany and Russia as the Fahrenheit is in England and America. It is the manufacturers who foster the popular demand for a variety of antique and objectionable apparatus, and it is the conservatism of human nature or the want of intellectual energy that leads us to prefer that which we have been so long accustomed to. Modern civilization frequently finds advantage in introducing new ideas, new apparatus, and better methods, and we have no doubt but that the use of the English mile, yard, foot, and inch, or the pound, ounce, dram, and grain will eventually be confined to the land surveyor, the farmer, and the market men, while everything that has an aspect of extreme accuracy or scientific relationships, including the daily weather bulletins, will be expressed in the metric system. Probably even now it would be a convenience to one-third of the citizens of the United States if the Daily Map and MONTHLY WEATHER REVIEW were to exhibit our fundamental observational data in both systems of measurement. In fact, the regret has often been expressed that the Weather Bureau did not foresee the change that is bound to come in the future and begin its career by the introduction of the metric system.

THE STRUCTURE AND FORMATION OF HAIL.

In the Vienna Sitzungsbericht, February, 1900, just received at the Weather Bureau, Dr. P. Czermak details some experiments on the cooling of water below its freezing point and the forms that result when it suddenly freezes. He concludes that not only can water, cooled below freezing, form a cloudy kernel of mixed ice and rain, but also water that has not been thus subcooled, and that, too, in a very deceptive manner; in many cases the opaque grains or nuclei of hailstones must have been formed of water that was not cooled below zero, centigrade, before it froze. Similar remarks apply to crystals of snow which may, therefore, have been formed at the freezing temperature without requiring any previous cooling to lower temperatures. Undoubtedly some hailstones are formed without these opaque nuclei.